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## REMAINING ERRORS IN MEASURES OF RETARDATION

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### THE VALUE OF AGE-GRADE STATISTICS

Age-grade censuses have been followed by improvement of conditions in many cities, and therefore it may be assumed that they have some value as instruments of agitation inciting administrators to make more detailed studies and to take remedial steps. It has become a question, however, whether the pioneer type of age-grade statistics is now worth the effort expended by teachers and compilers or is greatly beneficial to anybody in particular. These crude studies take account merely of the relation between a child's chronological age and his school grade. The significant fact is the progress the child has made, and this is not accurately shown by age-grade tables.

The age-grade system has usually involved the assumption that the first grade is suitable for children six or seven, or perhaps seven or eight years of age. Sometimes the grade and age allotments are a little more rigid, the first grade being intended for children six years of age, the second grade for children seven years of age, etc. Recent years have brought emphasis upon individual differences, capacities, and interests, and upon social conditions, rather than upon mere chronological age as a criterion for grade standing. It is well known that true age, or maturity, refers to the status of anatomical, of physiological, and of mental development rather than chiefly to the calendar.

There is nothing novel in the assertion today that an exhaustive age-grade-progress analysis is really ninefold rather than threefold, owing to the fact that pupils in any one of the three groups, over-age, at-age, or under-age, may have made faster-than-normal, normal, or slower-than-normal progress. Maxwell, Bryan, Cornman, Falkner, Ayres, and Greenwood years ago attacked the problem of age-grade censuses, and Van Sickle, Witmer, and Ayres in 1911 explained a simple device by which a fourfold, and, if desired, more numerous, grouping could easily be made.<sup>1</sup> The studies of Bachman, Bean, Henmon, Keyes, and of Allen, have further augmented the discussion of the subject. Ayres's Cleveland study makes plain the ninefold classification. Only a small number of cities or states, however, are publishing other than analyses based upon the threefold grouping, i.e., over-age, at-age, under-age. Notable examples of the use of the threefold grouping (at-age, under-age, over-age) are observed in the studies of Strayer for 318 cities,<sup>2</sup> of Berry for 225 Michigan towns and cities,<sup>3</sup> of Miss Rankin for 241,617 Wisconsin pupils,<sup>4</sup> in the study of Kansas pupils, in the Dayton, Ohio, analysis, in the San Francisco survey, and in the recent report of the Gary schools.<sup>5</sup>

Where individual record cards for pupils are not available there is of course extenuation for using the easily filled age-grade blank of other days. Some of our best writers on school administration either omit entirely any reference to the necessary ninefold type of analysis (combining the elements of age,

<sup>1</sup> VAN SICKLE, WITMER, and AYRES, "Provisions for Exceptional Children in Public Schools," *U.S. Education Bulletin No. 14*, 1911 (92 pp.), pp. 26-27.

<sup>2</sup> G. S. STRAYER, "Age and Grade Census of Schools and Colleges," *U.S. Education Bulletin No. 5*, 1911 (144 pp.).

<sup>3</sup> C. S. BERRY, *A Study of Retardation, Acceleration, Elimination, and Repetition in the Public Elementary Schools of 225 Towns and Cities of Michigan* (University of Michigan, 1916; 48 pp.), also in *Report of State Superintendent*, 1915-16.

<sup>4</sup> JANET R. RANKIN, *Wisconsin's Over-Age Children*. Issued by C. P. CARY, State Superintendent, Madison, Wis., 1916.

<sup>5</sup> *The Gary Schools, A General Account*. By ABRAHAM FLEXNER and FRANK P. BACHMAN. New York, 1918; 263 pp.), p. 186.

grade, and progress), or else only refer to the matter incidentally while describing the cruder threefold grouping.

#### OVER-AGENESS NOT ALWAYS RETARDATION

Over-ageness (pedagogical retardation) of a pupil, according to the arbitrary age-grade classification, is, of course, not synonymous with retardation in the sense of physical or mental immaturity. Many children are *over-age*, but nevertheless their individual records may show that they entered school at an age later than six years, or that by intermittent attendance they have lost time. There are even cases where over-age children actually have made rapid progress because they skipped grades after entering late. In the same manner the career either of an *at-age* or of an *under-age* pupil may have been characterized by late entrance, lost time, skipping grades, repeating grades, etc. It is evident that the common use of the word *retarded* as synonymous with *over-ageness* is misleading. If we use Ayres's latest terminology (for he, too, used the threefold grouping in his pioneer book, *Laggards in Our Schools*<sup>1</sup>) we find the correct classification of pupils according to age, grade, and progress to be ninefold.<sup>2</sup> Rugg also calls attention to this grouping.<sup>3</sup>

#### PEDAGOGICAL RETARDATION VARIABLE IN CAUSE

Before our consideration of age-grade-progress data and ninefold tables in contrast with the age-grade threefold type of analysis, we may pause to consider the merits of the assumption that most pedagogical retardation is actually a matter of slow progress. We shall find that, while this may be true as a general tendency, nevertheless there are wide variations of deep significance for school supervision. This fact is brought out by the ninefold, not by the threefold, type of group analysis.

<sup>1</sup> L. P. AYRES, *Laggards in Our Schools* (New York, 1909; 236 pp.).

<sup>2</sup> *Ibid.*, "Child Accounting in the Public Schools," *Cleveland Survey*, 1916 (68 pp.), pp. 40-47.

<sup>3</sup> HAROLD O. RUGG, *Statistical Methods Applied to Education* (New York, 1917; 410 pp.), pp. 347-48.

It has been assumed that by far the majority of children who are over-age are those who have actually made slow progress—that is, repeated one or more of the grades through which they have passed. It is desirable to test the probable variation in this matter by means of figures based on actual age-grade-progress analyses. For this test there are accessible two arrays of statistics. The one comprises data gathered during the years 1914 and 1915 in the city of New Orleans. The other is the result of an age-grade-progress analysis made by Clarence A. Rubado, a student of the University of Wisconsin working under the writer's direction and with the co-operation of Superintendent R. B. Dudgeon, of the city of Madison, Wisconsin, during 1916. From these data the writer has derived Table I.

TABLE I

PROPORTION OF OVER-AGE PUPILS WHO HAVE MADE SLOW PROGRESS AMONG SIX GROUPS, OR 60,675 CHILDREN

CITY	TOTAL REGISTER	TOTAL OVER-AGE		FOR ALL GRADES OVER-AGE AND SLOW PROGRESS		PERCENTAGES OF OVER-AGE PUPILS IN EACH GRADE WHO MADE SLOW PROGRESS							
		No.	Per Cent	Avg. Per Cent	A.D.	I	II	III	IV	V	VI	VII	VIII
New Orleans, La., 1914-15	Boys, 13,844	5844	42	68	8.5	58	67	73	80	78	73	61	50
	Girls, 14,668	5241	36	63	8.3	57	61	70	74	72	69	57	44
New Orleans, La., 1913-14	Boys, 13,792	6083	44	71	6.8	61	74	74	81	79	72	74	55
	Girls, 14,756	5835	40	68	8.1	56	66	76	78	83	65	64	57
Madison, Wis., 1916-17	Boys, 1,833	694	08	75	4.9	66	80	79	75	72	79	81	67
	Girls, 1,782	493	28	67	7.3	46	65	71	79	77	63	69	64

Table I seems to indicate definite tendencies among the 60,675 pupils with reference to the relation of over-age and slow progress. We may draw up these three suggestions from the table:

1. If we *disregard* (a) marked differences between grades and sexes, and (b) variabilities, then the general average, about 69 per cent (for New Orleans, 71 per cent; for Madison 68 per cent), gives a general estimate of 70 per cent of over-ageness due to slow progress.

2. This general average is illusory, and it is unreliable for general administrative use in estimating the significance of over-ageness in the various groups. For example: (a) In 19 out of 24 grade-groups the over-age girls exhibit lower percentages of slow progress than do the boys. (b) Grades I, II, VII, and VIII, in more than half of the groups, fall far below the 70 per cent estimate. (c) Doubtless considerable variation would appear in the foregoing particulars were further comparisons to be made of age-grade-progress records from many cities rather than from the two cities in the present instance. These exceptions, however, disprove any general assumption that over-ageness is invariably due to slow progress.

3. Where the proportion of over-age children who have made slow progress is relatively low, it indicates lost time, intermittent attendance, etc., which demand co-operation on the part of parents. It is unjust to impute to the school either the chief blame for the causation, or the burden of removal, of a considerable proportion of existing over-ageness or alleged "retardation." This constitutes an incentive to scientific statistical work in school systems, as well as to more effective help on the part of parents' school associations.

A similar table could be made from available arrays of data, in order to ascertain the proportions of at-age ("normal") and under-age ("accelerated") pupils who are respectively of slow, of usual, or of rapid progress, as gauged by the criterion of promotion records.

## AGE-GRADE-PROGRESS STUDIES

It has been ten years since the extensive and pioneer studies of Ayres and of Strayer,<sup>1</sup> and since that time city school systems have introduced individual record cards for pupils, which render much easier than formerly the accurate study of age-grade progress. Averill notes a tendency to get away from a liberal margin of "years of normal age" which would enable any city to have a comfortable preponderance of "normal" pupils, and perhaps to exceed the record of other cities.<sup>2</sup> We shall present here in abbreviated form illustrative age-grade-progress studies from three cities which bring out the contrast to the older method.

During two consecutive years, 1913-14 and 1914-15, with the help of teachers and principals and Superintendent Gwinn, of New Orleans, the writer obtained complete age-grade-progress data from 82 schools.<sup>3</sup> The Ayres standard was used; that is, a child six or seven years of age in the first grade, or one seven or eight years of age in the second grade, was considered to be of "normal age," etc. The published tables which summarized the data showed (1) a fourfold age-grade-progress analysis of each grade of every school, (2) the central tendency for the city in each age-grade-progress group, (3) the average deviations for the city, (4) the number and percentages of present repeaters, and (5) of beginners.

In Cleveland, Ohio, during June, 1915, a classification of all of the public-school pupils was made by Ayres into children who are below normal age, of normal age, and above normal age for their grades, and these three groups were again classified according to progress into groups making respectively rapid

<sup>1</sup> G. S. STRAYER, "Age and Grade Census of Schools and Colleges," *U.S. Education Bulletin* No. 5, 1911 (144 pp.).

<sup>2</sup> W. A. AVERILL, *Seventeenth Yearbook, Nat. Soc. for the Study of Education*, 1918, chap. viii.

<sup>3</sup> D. S. HILL, *Measurements in Elementary Education* (New Orleans, 1914; 70 pp.), pp. 5-38; also in *Report of Board of School Directors*; D. S. HILL and MARY L. RAILLEY, *Educational Research in Public Schools 1915* (211 pp.), pp. 18-35; also in *Report of Board of School Directors*.

progress, normal progress, and slow progress—altogether yielding nine age and progress groups.<sup>1</sup> Ayres considered a child seven years of age in the first grade to be of “normal

TABLE II

AGE AND PROGRESS CLASSIFICATION OF CHILDREN IN ELEMENTARY SCHOOLS OF CLEVELAND, OHIO, AT CLOSE OF YEAR 1914-15

PROGRESS	AGE FOR GRADE		
	Young	Normal	Old
Rapid.....	4,574	1,034	871
Normal.....	21,262	16,637	4,136
Slow.....	480	6,451	15,344

age” in Cleveland. Table II shows the general results for Cleveland, and Fig. 1 indicates the same data reduced to percentages. Ayres did not print the results for each grade of each school, or for the schools separately for other than the over-age slow-progress group. For this group, the percentages range from 9.5 to 47.4 per cent; median 20.7 per cent.

In Madison, Wisconsin, Clarence A. Rubado, as indicated above, made during the fall of 1916 a study of the Madison, Wisconsin, public schools. Mr. Rubado secured and analyzed age-grade-progress data from all of the twelve schools of Madison. The completed tables were presented to the teachers and principals and have been of considerable supervisory value, it is said. The Madison study is quite exhaustive, because the analyses included all of the different divisions both of the New Orleans and of the Cleveland groupings.<sup>2</sup> The study of Mr. Rubado has not been printed, and we present here for the first time one of his charts—that one showing the averages for each grade for the city as a whole (Fig. 2). It

<sup>1</sup> L. P. AYRES, “Child Accounting in the Public Schools,” *Cleveland Survey*, 1916 (68 pp.), pp. 40-47.

<sup>2</sup> C. A. RUBADO, *The Present Status of the Pupils in All of the Public Elementary Schools of Madison, Wisconsin, with Regard to Progress-Grade-Age, Repetition, and Related Problems*. Thesis; 57 pp.) University of Wisconsin, 1917.



will be observed that Mr. Rubado first classified the pupils into children of rapid progress, normal progress, and slow progress, and then subdivided these three divisions into the *over-age*, *at-age*, and *under-age* groups (altogether, nine groups).

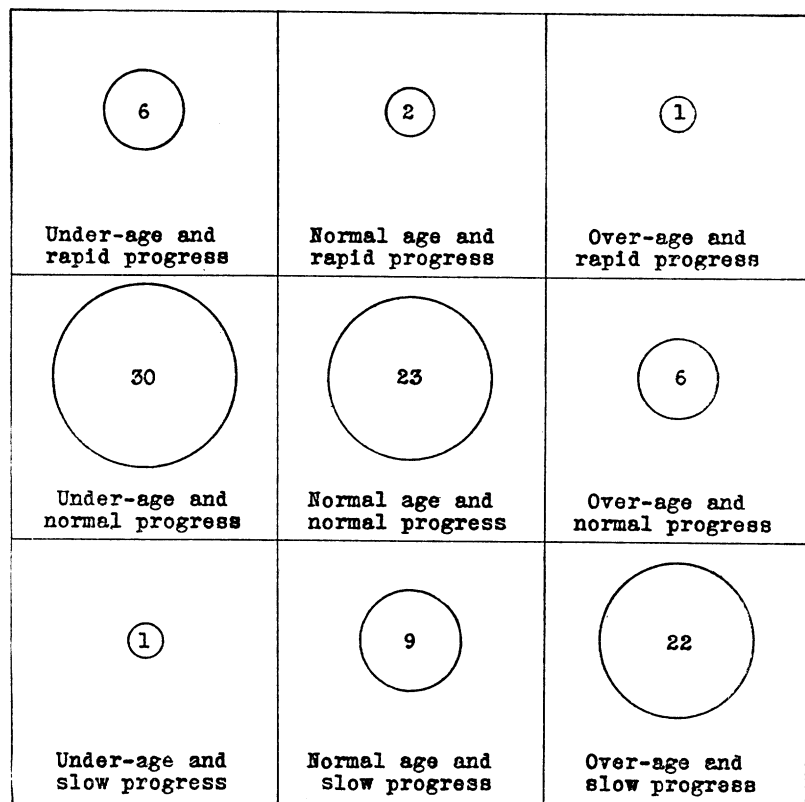


FIG. 1.—Percentage of children in each age and progress group in elementary schools of Cleveland, Ohio, at close of year 1914-15.

He also shows a tenth group, the *pupils at present repeating* and, an eleventh, the *numbers of beginners*. It is to be noted that the age standard for Madison is one grade per year, and entrance age is six years. Fig. 2 graphically shows 144 facts of possible supervisory value for the Madison schools.

## METHODS OF TABULATION AND INVESTIGATION

The usual scientific care should dominate all studies of child-accounting. There are well-known precautions to be observed in data getting, in analysis, and in inferences. Buck-

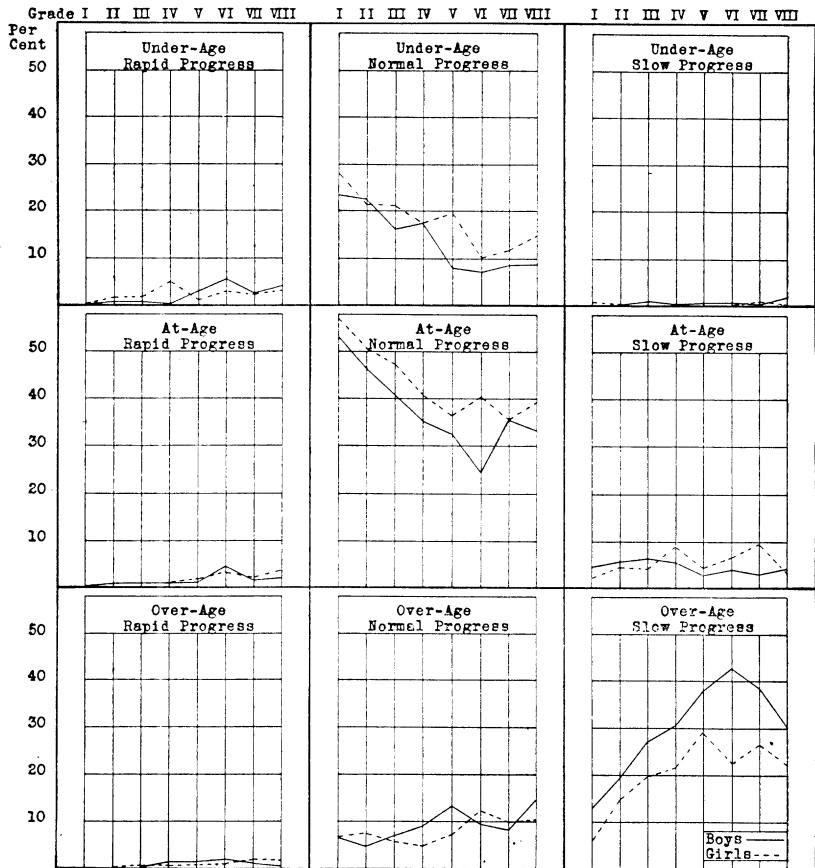


FIG. 2.—Age-grade-progress analysis of Madison schools

ingham,<sup>1</sup> has formulated these guiding suggestions for gathering statistics in regard to the age and grades of children:

1. It is desirable to receive the information directly from its source.

<sup>1</sup> B. R. BUCKINGHAM, "Efficiency Indices," *Bulletin of Extension Division, Indiana University*, No. 6, 1917, pp. 107-8.

2. All tabulations should be made at the central office, under the direction of a person trained for this kind of work.

3. The record of the ages of children should be taken at the time when the problem of adjustment arises and when remedial measures may, therefore, be taken.

4. The standard should be such that children are regarded as over-age if they are not in the way of being graduated by the time they reach the age of fifteen.

5. The central office should promptly report to principals and teachers the rates for their schools and classes, and should make available to them all the supporting data.

Buckingham has used an ingenious blank for data-gathering which necessitates only entering a score-mark opposite the year and under the month of a pupil's birthday.<sup>1</sup> It is to be noted, however, that the blank yields only age-grade (three-fold) analyses, and that it would be desirable to try out this blank and other blanks on a large group of teachers in order to ascertain the relative numbers of errors of age made upon each kind of blank, as checked by individual record cards.

The difficulty of obtaining accurate age and progress data from teachers is an old one. Where accumulative record cards are not kept, special investigations by teachers to ascertain the age and the school records of pupils are necessary. The difficulty can be met eventually by means of: (1) well-kept, accumulative individual record cards; (2) simple and clear blank forms for age-grade-progress censuses, forms easily understood and to be filled out with a minimum of labor; (3) careful explanations and definitions given to teachers, both in writing and orally by principals who have been previously instructed; (4) assurances to them that some definite information of value and interest will accrue to them, and seeing to it that these are delivered by a central office, possibly by a department of educational research.

<sup>1</sup> B. R. Buckingham, "Efficiency Indices," *Bulletin of Extension Division, Indiana University*, No. 6, 1917, pp 107-8.

If there are available record cards containing accurate memoranda of age and terms in school, it is possible, particularly in a single school, to sort these cards into nine piles for each grade, corresponding to the age-grade-progress grouping.

PROGRESS AND AGE STUDY.										Public Schools, _____ 191__									
BOYS.		School _____					Teacher _____					Grade IIIA							
Terms in		-Ages-																	
School		5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total			
1																			
2																			
3					1	1										2			
4		1	2	2	2	1										8			
5		1	5	25	4	1										36			
6			4	6	5	3										18			
7				3	2	1										6			
8																			
9																			
10																			
11																			
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17																			
18																			
19																			
20																			
21																			
22																			
23																			
24																			
25																			
Total		2	11	37	14	6										70			
Beginners				1	1											2			
Repeaters			1	2	3	2										8			
By beginner is meant a child for first time in any school.																			
By repeater is meant a child now repeating work of last term.																			
INSTRUCTIONS to ROOM TEACHER.																			

FIG. 3

In the experience of the writer in directing three censuses for cities, a fruitful blank form to be used in the gathering of age-grade-progress statistics is one developed originally by him from the diagram presented by Van Sickle, Witmer, and Ayres in 1911.<sup>1</sup> In its present form (with the added spaces

<sup>1</sup> VAN SICKLE, WITMER, and AYRES, "Provisions for Exceptional Children in Public Schools," *U.S. Education Bulletin No. 14*, 1911 (92 pp.), pp. 26-27.

for beginners and repeaters) one can obtain from it both the conventional age-grade (threefold) tables and also the better age-grade-progress (ninefold) tables. The blank as we have developed and used it is represented in Fig. 3. This figure represents the records as they would be turned in by teachers of two classes belonging to the Grade IIIA (first term). The normal age for Grade III is assumed to be eight years at the last birthday. It is supposed that some of the children in this hypothetical class entered the first grade younger than six years. The date of the taking of the statistics, say early in October or March, must be adhered to in succeeding censuses year after year if comparisons are to be made. The heavy lines are drawn in afterward at the central office (department of educational research) by a clerical assistant working under the direction of a trained official. It is evident that the nine spaces so marked off contain the nine age-grade-progress groups, since five half-year terms is the normal time in which to progress to within the third grade, and eight years is the age-grade standard in this instance. We have, therefore, the results presented in Table III.

TABLE III

	No.	Per Cent
1. Normal-age with normal progress.....	25	35
2. " " " rapid " .....	3	4
3. " " " slow " .....	9	13
4. Under-age with normal progress.....	6	8
5. " " " rapid " .....	3	4
6. " " " slow " .....	4	6
7. Over-age with normal progress.....	5	7
8. " " " rapid " .....	4	6
9. " " " slow " .....	11	16
10. Beginners.....	2	3
11. Repeaters from last term.....	8	12

In addition to the eleven kinds of facts shown in Table III, many other items may be derived from the data-blanks after

the results have been combined for each grade and division in all of the schools, and for the city as a whole. For example, continuing the enumeration, we note these further items obtainable from this blank form:

12. Position of thirteen-year-olds (i.e., Ayres's "index of efficiency").
13. Age-grade tables, for schools or city.
14. Age-grade-progress tables, for schools or city.
15. Average rates of progress through grades.
16. Total registration.
17. Registration by ages.
18. Registration by grades.
19. Basis for comparison of actual numbers of beginners with estimates as by Strayer, Thorndike, or Ayres.
20. Each of above data separately for boys and for girls.
21. If desired, the amounts of over-ageness or of slow progress can be obtained by years or terms.

It is obvious that the blank shown in Fig. 3, properly used, will reveal a score of facts of interest annually to the board, superintendents, principals, teachers, and parents. Comparisons of city with city are of little value, and are usually invalidated by different conditions. The important thing is constructive, local use of such statistics for the discovery and location of various groups of pupils demanding special or individual attention.

It is suggested that in due time the National Society for the Study of Education, or possibly the United States Bureau of Education, might undertake advisedly a thorough study of age-grade progress, now that a decade has passed since the laborious study of Strayer and many cities have installed individual record card systems. It is true, however, that this is not the time to make a national issue over a question in school statistics, for other and obvious things sorely need to be done now, in these months of reconstruction after the World War.